

## Memorandum

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To: GUSTAF SILVA - DISTRICT 11  
TRANSPORTATION ENGINEER  
DUTY SENIOR OFFICE MS:73

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HIGHWAY REALIGNMENT

From: DEPARTMENT OF TRANSPORTATION  
DIVISION OF ENGINEERING SERVICES  
Geotechnical Services  
Office of Geotechnical Design - South

Subject: MATERIALS INFORMATION

Per your verbal request of 09/23/2002, we have conducted a limited investigation of the proposed construction zone located north of State Route 76 (SR-76) east of Rincon Rancho Rd. The area investigated is a rectangular zone defined by the following boundaries: On the south, the site is bounded by the existing north edge-of-pavement of SR-76; on the west, the site is bounded by the east edge of pavement of Rincon Ranch Road ("RRR" line); on the north, the site is bounded by an imaginary line projected eastward from an origin located at station 10+60 of the "RRR" line (approximately 40 m north of the Intersection of Rincon Ranch Road and SR-76); and on the east, the site is bounded by an imaginary line that projects northward from an origin located at station 105+80 (+/-) of the "R" line (SR-76).

With your request, you provided the following supporting documents:

- An index and title sheet of the proposed project (dated 07/29/2002; revision 03/12/2002),
- A series of printed digital images of the site depicting large boulders projecting above existing grade.
- A copy of a memorandum from the Office of Materials and Foundations Roadway Geotechnical South; titled: SR-76 Curve Realignment (dated 03/22/2000).
- And upon our request, a series of black and white aerial photographs (1:2400 scale; dated 11-30-98) of the project corridor.

You expressed a concern that the presence of large granitic boulders exposed at the site implies that subsurface materials will be difficult or impossible to rip with conventional construction equipment and that blasting may be required. You requested that we assess the site excavation characteristics and that we provide a description of the materials that we anticipate will be encountered in excavation. It is our understanding that this information will be provided to prospective bidders to advise them of site conditions.

## DISCUSSION

On 09/24/2002, we conducted a field reconnaissance of the referenced interval of the propose project. We also conducted a brief search for relevant open-file-reports and relevant published reports and maps. Two published geologic maps that include the site were reviewed. These were Geology and Mineral Resources of San Diego County (compiled by H. Webber 1958-1959 in the California Division of Mines and Geology County Report 3; 1963) and the Geologic Map of California Santa Ana Sheet (1986). Both maps indicate that the site is mantled by quaternary terrace and alluvial deposits.

Observations of site materials evident at the surface are consistent with those depicted on the referenced geologic maps. Site topography is low relief, lobate, and concave upward. Surface materials are comprised of sub-rounded to well-rounded boulders, gravels, sands, and silts. These features are consistent with that of coalescing alluvial fans and/or braided stream deposits. What this means is that we anticipate that the materials to be encountered at proposed excavation depths (2.1 m maximum) are sedimentary in origin and therefore, should be rippable by heavy construction equipment such as a D-9 and D-11 bulldozer. We anticipate that the site stratigraphy (to the depth of the proposed excavation) will be comprised of materials ranging from silt to boulder deposits (Uniform Soil Classification designations of GP, GW, GM, GC, SP, SW, SM). These materials, in aggregate, will range from well graded to poorly graded and are well consolidated but non-indurated. Clast sizes vary from silt to large boulder (3-4 m or more in diameter). Large boulders are common. It should be anticipated that the boulders will be both nested in clusters as well as isolated within a matrix of finer sediments (cobbles, gravels, sands, silts, and clays). Nesting may complicate excavation and may preclude the use of some types of equipment such as backhoes and excavators unless materials are fragmented first.

The boulders, cobbles, and gravels are comprised of granitic and metamorphic rock (gneiss and schist). Typically the boulders are fresh to slightly weathered and therefore are extremely hard, strong rock (unconfined compressive strength >100 MPa). The large boulders will require fragmentation to facilitate disposal. The weathering of cobbles and gravels is more variable and ranges from fresh to intensely weathered. This will limit their use as an aggregate source.

## CONCLUSIONS AND RECOMMENDATIONS

The site is comprised of alluvial deposits of an undetermined thickness overlying bedrock comprised of weathered granitics. The gradation of the alluvial deposits are highly variable and includes large boulders (>3-4 m in diameter). Boulders will tend to be nested. The site is rippable with conventional heavy construction equipment such as D-9 and D-11 bulldozers; but will prove problematic to backhoes and excavators. Large boulders are common occurrences and will require fragmentation to facilitate loading and hauling.

There are many fragmentation methods available to contractors. The choice of method is chiefly based upon economics. Methods include hoe-rams, hydraulic hammers and splitters, wedges, chemical expandants, and drilling and blasting. Most of these methods require the rock to be drilled first.

This site is conducive to blasting, and therefore a blasting specification should be released with the bid documents. We anticipate that blasting will be limited to boulder splitting. The nearest structure to the job site is 128 m as measured by a laser range finder. As long as blasting is conducted a minimum of 100 m from the structure, a pre-blast survey will not be required; however, the contractor should have at least one seismograph adjacent to the nearest structure. If explosives are to be used, then a blasting plan should be submitted to the resident engineer prior to the commencement of blasting. Staff from Geotechnical Services is available to review blasting plans. Due to the surficial nature of the deposits and the proximity of structures, blasting mats or other measures will be required to control flyrock.

Due to the nature of the deposit, spoils will most likely be poorly graded to gap graded and will exhibit an earthwork factor greater than 1 (swell factor). If boulders and large clasts are screened from the spoils, then anticipate a significant shrinkage factor (earthwork factor <1). Due to clasts size and distributions, special effort will be required to avoid nesting boulders in order to achieve compaction in spoil stockpiles or embankments constructed of this material. The Caltrans Standard Specification 19-5 should be adhered to rigorously.

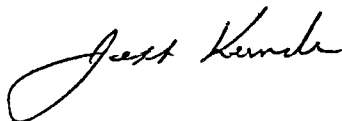
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